TECHNICAL MEMO 8

PROCEDURE FOR COMBINING ASBESTOS MASS ESTIMATES FOR THE COARSE AND FINE FRACTIONS OF A SOIL SAMPLE

1.0 INTRODUCTION

As described in SOP ISSI-LIBBY-01, soil samples collected from the Libby site are prepared for asbestos analysis by sieving through a 1/4 inch sieve to generate two separate size fractions: Coarse (retained on the 1/4 inch sieve) and Fine (passing through the 1/4 inch sieve). Each of these two fractions are then analyzed for asbestos as follows:

- The Coarse sample is analyzed using steriomicroscopy and PLM to identify coarse particles that are asbestos, and estimating the mass percent by weighing those asbestos particles gravimetrically (SOP SRC-LIBBY-02).

- The Fine fraction is ground to 250 um particle size and is evaluated by PLM to estimate the mass fraction, using site-specific reference materials as a frame of reference (SOP SRC-LIBBY-03).

This tech memo describes the procedure for combining the results for these two estimates.

2.0 APPROACH WHEN BOTH VALUES ARE QUANTITATIVE

Two basic options are available for combining the results of the mass percentage estimates in the coarse and the fine fractions when both are quantitative. These are described below.

<u>Option 1</u>

In Option 1, the mass fraction of asbestos in the combined (total) sample is calculated as:

$$MF(total) = [M(fine) \cdot MF(fine) + M(coarse) \cdot MF(coarse)] / [M(fine) + M(coarse)]$$

where:

MF = Mass Fraction of asbestos (expressed as a percentage)
M = Mass (grams) of the fraction

In this approach, the final value is equal to the value that would have been obtained if the entire sample (coarse plus fine) was analyzed as a single unit (i.e., without sieving). A potential disadvantage to this approach is that the presence of coarse non-asbestos particles (e.g., rocks) will "dilute" the estimate of asbestos concentration in the fine-grained sample, even though the hazard associated with the fine material is not likely to be substantially altered by the presence of those rocks.

Option 2:

In Option 2, the estimate of MF(total) is derived using the following equation:

$$MF(total) = [M(fine) \cdot MF(fine) + M(coarse) \cdot MF(coarse)] / [M(fine) + M(coarse\ amphibole)]$$

where:

M(coarse amphibole) = Mass of the amphibole from the coarse fraction (grams)

This approach is analogous to assuming that all asbestos that occurs in the coarse fraction could be degraded to smaller particles that could pass through the 1/4 inch sieve and hence could occur in the fine fraction, and the calculation gives the mass percent that would result if this were to occur. This has the advantage that it estimates the highest concentration that could occur in the fine fraction, but does not account for the effect of coarse non-asbestos particles.

3.0 APPROACH WHEN ONE ESTIMATE IS QUALITATIVE

In the PLM visual estimation approach for evaluating the fine fraction, if the concentration of asbestos is judged to be less than 1% by mass, the reported result is semi-quantitative, using the following scheme:

PLM Laboratory Report			Description
Qual	Conc (wt.%)	Bin	
ND		A	Asbestos was not observed in the field sample
Tr		B1	Asbestos was observed in the field sample at a level that appeared to be lower than the 0.2% reference material
<	1	B2	Asbestos was observed in the field sample at a level that appeared to exceed the 0.2% reference material but was less than the 1% reference material.

If there is a quantitative estimate of asbestos content in the coarse fraction, the estimated asbestos content of the combined fractions may be estimated using Option 1 and Option 2 (above), assigning the following surrogate point estimate values for the qualitative bins:

Bin	Nominal Range (%)	Surrogate Point Estimate (%)
A (ND)	C = 0%	0%
B1 (Trace)	0%<C<0.2%	0.1%
B2 (<1%)	0.2≤C<1.0%	0.5%

EXAMPLE CALCULATIONS

CASE 1: Both Fractions are Quantitative

Fraction	Mass (g)	Mass Fraction (%)
Fine	154	2.2%
Coarse	53	0.8%

Option 1:

MF(total) = [154*2.2 + 53*0.8] / [154 + 53] = 1.8%

Option 2:

MF(total) = [154*2.2 + 53*0.8] / [154 + (53*0.8)] = 2.5%

CASE 2: Fine Fraction Data are Qualitative

Fraction	Mass (g)	Mass Fraction (%)
Fine	154	< 1%
Coarse	53	0.3%

Option 1:

MF(total) = [154*0.5 + 53*0.3] / [154 + 53] = 0.4%

Option 2:

MF(total) = [154*0.5 + 53*0.3] / [154 + (53*0.3)] = 0.5%